Feeding Experiments, Milk Records, etc.

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RALEIGH, N. C.

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The Station is glad to receive any inquiries on agricultural subjects *Address all communications to the Agricultural Experiment Station, and not to individuals.* They will be referred to the members of the Station staff most competent to answer them.

The accompanying bulletin relates to the feed, milk production and care of cows, and is offered with the hope that it will prove interesting to those who are studying these questions. The old plan of feeding was to give to stock not only enough feed for consumption, but a large quantity also to be trampled under foot. When the profits from farming were much larger than at present the loss was not so serious as it is now, although it was probably as great. It is the desire of the Experiment Station to call attention to the waste which comes from feeding a badly "balanced" ration, and to suggest a better and more economical proportion between the different feeding stuffs used. The first portion of the bulletin contains the results from feeding ordinary substances grown upon North Carolina farms, with the addition of easily obtainable substances such as corn silage, cotton seed meal, wheat bran, sweet potatoes, cotton seed, corn fodder, cow-pea meal and soy-bean silage, corn shucks, wheat-straw, &c. The conclusions are to be found on page 165, and the figures on pages 166 to 169, inclusive.

The second portion of the bulletin is also a feeding experiment, but in this case pigs are used instead of cows, and the feeding stuffs used are arranged with the object of contrasting skim-milk and buttermilk from cream (not from whole milk).

The third portion of the bulletin contains the record of milk and butter production of the Experiment Station herd during 1895 and 1896. There were difficulties to meet such as might be met by any dairyman. This of itself may prove a source of encouragement to one whose experiences may have been similar to ours. The interest for one who cannot make a sufficient outlay for the purchase of the more improved breeds of stock, may be increased upon learning that the herd was composed of common cows.

Some records of the temperature of the barn are shown, and also the readings of thermometer in a standard shelter, which show the barn of the Station to be very well suited for this climate.

The statistician of the United States Department of Agriculture (year book for 1896) estimates in round numbers the number of milch cows in North Carolina in January, 1897, at nearly 277,000, the oxen and other cattle 345,000, horses 146,000, mules 111,000, sheep 319,000, swine 1,456,000, making a total of 2,654,000 of farm animals. These animals are to be fed, and even a slight waste for each animal applied to the total number will make a loss to the State of a very great sum. If this waste is estimated at one dollar per year for each animal the annual loss for this State is $2,654,000, or if we put the loss at one cent per day for each animal the annual loss for the State will be nearly ten millions of dollars.

An explanation of the terms used in the feeding experiments will be found in Bulletin No. 106, which will be sent upon application.

The Station will be glad to answer any inquiries from any one who wishes to improve his method of feeding.

W. A. WITHERS,
Acting Director.

Publication approved:
ALEX. Q. HOLLADAY,
President.

FEEDING EXPERIMENTS, MILK RECORDS, Etc.

F. E. EMERY, Agriculturist.

COMPARATIVE EFFECT OF SOME RATIONS FED TO MILCH COWS.

At different times some Station cows have been fed experimentally on different combinations of foods at hand. The object in view has been to obtain some indication of the relative value or economy in the use of the combinations fed. In the trials detailed below the rations fed have been the most extensively-used winter rations of meal mixtures with silage, compared with some others compounded of such articles as North Carolina farmers raise in abundance, and which have been "balanced" by use of articles easily obtained by them. All the rations, except the preliminary and silage rations and the combination of hulls and meal, have been compounded for correspondents, and were fed here to observe their influence on the yield of milk. It is to be regretted that there were no fresher cows available for this experiment. Cow No. 5 was the only one which was yielding anything like a reasonable amount of milk. Her period of lactation began November 17, 1894. Dora McKee, the cow with the next longer period of lactation, had been milked since May 24, 1894, while cow No. 18 had been milked for nearly, and No. 19 quite, a year when this experiment was begun, in January, 1895.

The plan of this experiment makes each cow's record complete in itself, and no allowance need be made for natural decline in flow of milk, because the average time from the beginning of lactation is the same. Thus, in averaging, the first and fourth are set against the second and third for periods of equal length.

Previous to the first period of this experiment the cows were fed on corn silage and a meal ration of one part cotton-seed meal to two parts of wheat bran, by weight. The amount of this mixture allowed for each cow is usually fixed with regard to the amount of milk being produced, time of lactation, and individuality of the cows; but the silage is fed in quantities as great as the cows will consume with the grain allowed. During this winter the cows have been fed heavier than usual to hold them up in milk yield, because they were purposely held back in breeding. A preliminary period on this ration of silage and meal mixture, as long as those during which other combinations were to be fed, was taken for comparison. The yield of milk for this period, with per cent. of fat at its close, were determined, as well as the live weight of the cows. Of two rations to be compared, one was to be fed through one period; then the other ration would be fed through a double period, or twice as

many days, after which the first ration would be fed again in another period. Averaging the yields from the two periods during which each ration was fed, should give a fair comparison between them, with no necessity of making an allowance for the advance in the period of lactation from one period on one ration to another period on the other ration.

The temperature, usually very mild here at Raleigh, did not vary more than usual during the progress of this feeding, and there was very even winter and spring temperature, except in the midst of the first period, when there was a marked cold wave, which was felt very decidedly here. The writer has observed the changes of winter weather to so affect the flow of milk from a herd of cows as to obscure the effect of considerable changes in rations.*

The yield of milk from all the cows fell off at the time of the lowest temperature, and Dora McKee and No. 5 lost a little more than did the others, which were being fed a ration which had already begun a reduction of the yield. This was helped somewhat by the cold weather, but it is not so marked because these cows were yielding so little. The maximum, mininum and mean temperatures were taken in the stable by a Draper's self-recording thermometer. This record is given on the following page.

Effect of Changes of Food.—In passing from the ration of the preliminary period, Dora McKee gained in both yield and total fat found per day, and held out so well through that period that, after being fed on it fourteen days, she was given more milk than before. Less milk was produced during the second period than in the first, but a gain was made in the third period on the same ration of silage and meal mixture as was fed during the second period. A still further gain was made in the fourth period, which seems to indicate the ration of sweet potatoes, raw cotton seed, pulled fodder and cowpea meal was an excellent one for milk and butter production. It will be noted, too, that this ration, while agreeing closer with the standard in dry matter, yet differs more from the standard in the larger amount of nutritive substance than does the ration of silage, which costs considerably less. The cost in this case was increased about one-third, while production of butter fat was increased about one-fifth when the cow was yielding one gallon of milk per day and from ten to thirteen ounces of butter fat, varying from eleven to fourteen or fifteen ounces of butter per day.

Cow No. 5.—The ration fed this cow differed from the above, in that corn shucks took the place of fodder, and the meal was a mixture consisting of cotton-seed meal, six parts; corn meal, two parts; and cowpea meal, one part, against raw cotton seed and cowpea meal in the other ration. The cost here was practically the same as that of the silage, cotton-seed meal and wheat bran ration fed in

* Houghton Farm (Mountainville, N. Y.) Feeding Experiment.

TEMPERATURE IN EXPERIMENT-FARM BARN.

PRELIMINARY PERIOD.				FIRST PERIOD.				SECOND PERIOD.				THIRD PERIOD.				FOURTH PERIOD.			
	TEMPERATURE.				TEMPERATURE.				TEMPERATURE.				TEMPERATURE.				TEMPERATURE.		
	Max.	Min.	Mean.		Max.	Min.	Mean.		Max.	Min.	Mean.		Max.	Min.	Mean.		Max.	Min.	Mean.
Jan. 18, 1895	52.5	39.5	46.	Feb. 1	45.5	38.5	42.	Feb. 15	36.5	29.5	33.	March 1	69.	56.5	63.	March 15	60.5	55.5	58.
" 19, "	54.5	48.	51	" 2	45.5	37.5	40.5	" 16	35.5	33.5	34	" 2	64.5	46.5	56.	" 16	62.5	38.	56.
" 20, "	47.5	39.5	44.	" 3	37.0	31.5	35.	" 17	43.5	35.	38.	" 3	51.	39.5	45.	" 17	47.5	35.	40.
" 21, "	57.5	46.	50.	" 4	44.	34.5	42.	" 18	44.5	33.5	39.	" 4	55.5	44.	50.	" 18	55.	40.5	47.
" 22, "	57.5	47.	51.	" 5	39.5	32.5	36.	" 19	44.5	37.	41.	" 5	50.5	39.5	46.	" 19	56.	45.5	52.
" 23, "	50.	38.5	44.	" 6	37.5	28.5	34.	" 20	44.	35.5	39.	" 6	56.	42.	49.	" 20	54.5	39.	48.
" 24, "	48.5	39.5	44.	" 7	37.0	18.0	31.	" 21	50.	38.5	43.	" 7	59.	54.5	57.	" 21	45.	33.5	39.
" 25, "	52.5	39.	42.	" 8	21.0	12.5	17.	" 22	46.	39.5	43.	" 8	58.5	52.5	57.	" 22	46.5	38.	42.
" 26, "	57.5	44.5	52.	" 9	29.5	16.	22.	" 23	44.5	35.5	40.	" 9	51.5	38.5	45.	" 23	51.5	39.5	44.
" 27, "	44.	37.	41.	" 10	31.5	24.	27.5	" 24	50.	36.5	43.	" 10	59.5	43.	50.	" 24	51.5	42.5	48.
" 28, "	44.	38.	42.	" 11	33.5	27.5	30.	" 25	57.	36.5	48.	" 11	54.5	50.	52.	" 25	57.5	49.5	54.
" 29, "	42.5	39.	41.	" 12	33.5	22.5	31.	" 26	52.	47.5	50.	" 12	54.	49.	52.	" 26	55.5	50.	53.
" 30, "	44.5	41.5	43.	" 13	29.	20.5	24.	" 27	54.	41.5	48.	" 13	55.	51.5	53.	" 27	61.5	46.	53.
" 31, "	43.5	39.	41.	" 14	32.5	18.5	26.	" 28	62.5	49.	56.	" 14	60.5	52.5	56.	" 28	70.	53.5	60.
			632.				438.0				595.				731	" 29	63.	46.5	56.
																" 30	74.	52.	62.
																" 31	52.5	49.	50.
																			862.
Av'ge or mean temperature.			45.				31.				42.				52.				51.

periods two and three. This cow had been milking two months when the preliminary period began, and was, in that period, the last part of January, yielding upward of twenty-five pounds (three gallons) of milk daily, and it was computed to contain over one pound of butter fat daily, or equal to 8¼ pounds of butter per week. There was a falling off in yield of both milk and butter fat at the end of the first period, but the gain before the cold wave, and after it, left the average yield of milk more than during the preliminary period. The yield continued to diminish to the end of the experiment; but, in spite of the falling off in milk, there was a gain in the yield of butter fat near the end of the third period; so the yield was practically the same as a month earlier at the end of the preliminary period. The falling off in yield of milk continued in the fourth period. In the average there is practical equality of yields, with the balance in favor of the ration of silage, cotton-seed meal and wheat bran.

Cows Nos. 18 and 19.—These cows were fed alike. They were far along in lactation, and their yields of milk and butter fat were small. A ration of low cost, and yet one to encourage production of milk, was desired. They were not to come fresh in milk until late summer, and must pay as large a part of cost of keeping during this winter and spring as possible. They were fed cotton-seed hulls and meal for two periods. This is about the lowest-cost ration which can be found in the vicinity of the oil-mills. Farther from these mills the rations which require only the cotton-seed meal to be brought to the farm, and which may have been obtained by exchanging seed for it, may be the cheaper ration. At least, it is poor economy to buy and freight any coarse material when we have cornstalks, shucks and straw in abundant supply. In this ration of cotton-seed hulls and meal a ratio of nearly three and one-half of the former to one of meal was established and the cows given all they would eat at that rate. They would have taken much more meal, but it was withheld to induce them to consume the proportions desired. The digestible portion of the ration is given as calculated by the common method, like the other rations and according to actual digestion results. Both cows decreased in yield on the change from corn silage, cotton-seed meal and wheat bran when they were fed cotton-seed hulls and meal. No. 18 more than recovered the loss when changed to the ration fed in period two, and held up very well during the third period. She fell off again some in the fourth period, but the flow of milk was still, at the end of the fourth period, the last of march, equal to what it was at the end of January on the ration for the preliminary period. Cows Nos. 18 and 19 show a considerable more loss during period one than did either of the others. They were yielding less milk, but the cotton-seed hulls and meal ration could not support the cows and supply

as much milk as they had been producing before. The fall in temperature also helped to depress the yield in period one. No. 19 shows a greater loss in yield of milk in the fourth period than any other cow. From the near approach of the end of lactation this loss in yield was, perhaps, due as much as to the change of food. From this course, perhaps, cow No. 19 does not show the same result as does cow No. 18 from the same feeding. Although giving less milk with the hulls and meal ration, cow No. 18 yielded more butter fat during each period than from the ration fed in periods two and three. This difference amounted to fully two ounces per day. The lack of decided result from cow No. 19, and this positive one in favor of cotton-seed hulls and meal for production of butter, makes this point interesting for another trial. It seems as though there might have been practical agreement but for the interference of lactation by cow No. 19 drawing toward a close. The hulls and meal seem to lead for butter production, while for yield of milk they are inferior to the ration of corn shucks with wheat straw for the coarse part, and corn meal, ground wheat and more cotton-seed meal combined in rations as for periods two and three. Yet, given a quantity of shucks and straw, on any farm it would be a false policy to waste these and use hulls. Perhaps in some other combinations they may lead the hulls and meal, both for milk and butter production.

Conclusions.—1st. The ration of sweet potatoes, raw cotton-seed, pulled fodder and cowpea meal gave better results for cow Dora McKee than did corn and soy-bean silage and cotton-seed meal, with wheat bran mixed in ratio of one to two, by weight.

2d. The corn and soy-bean silage, with cotton-seed meal and wheat bran, gave a better result with cow No. 5 than did sweet potatoes and corn shucks, with a mixture of cotton-seed meal, corn meal and cowpea meal mixed in the proportions of six, two and one.

3d. Cotton-seed hulls and meal, for butter production, leads corn shucks and wheat straw with corn meal, ground wheat and cotton-seed meal mixed in proportions of two, three and five. The latter made the most milk, however. Cow No. 19 lost in the last period so much, the result was evened up and became indeterminate.

The tables of rations and rates of production of milk and butter fat are appended for those who may wish to see these figures :

DORA MCKEE.—*Rations Reduced to 1,000 Pounds Live Weight and Calculated to Digestible Constituents.*

NUMBER OF PERIOD.	KINDS OF FOOD.	Pounds Actually Eaten.	Total Dry Matter Per 1,000 Pounds.	DIGESTIBLE CONSTITUENTS. Protein, lbs.	Carbo-hydrates, lbs.	Fat, lbs.	Nutritive Substance, lbs.	Ratio 1:—	Pounds of Milk Yield Per Day for Whole Period.	Pounds Milk Per Day Being Tested.	Pounds Butter Fat Found Per Day.
Preliminary ..	Corn silage	33.7	20.37	2.30	8.60	0.68	11.58	4.49	9.10	8.82	.6238
	Cotton-seed meal and wheat bran, 1 to 2	9.0									
First Period...	Sweet potatoes	10.	25.11	3.00	15.20	1.45	19.65	6.27	9.46	9.55	.6897
	Raw cotton seed	5.									
	Pulled blade fodder (corn)	9.5									
	Cowpea meal	7.8									
Second Period	Corn and soy-bean silage	36.	22.92	2.64	9.66	0.78	13.08	4.4	9.03	9.23	.6257
	Cotton-seed meal, 1, to wheat bran, 2	10.									
Third Period..	Corn and soy-bean silage	34.5	22.33	2.70	9.26	0.82	12.78	4.19	9.55	9.63	.648
	Cotton-seed meal, 1, to wheat bran, 2	10.									
Fourth Period.	Sweet potatoes	10.	24.31	2.91	13.66	1.28	17.85	5.8	10.07	10.37	.7753
	Raw cotton seed	5.									
	Pulled blade fodder (corn)	9¼									
	Cowpea meal	8.									
	Average first and fourth periods		24.71	2.955	14.43	1.365	18.75	6.035	9.765	9.96	.73
	Average second and third periods		22.63	2.67	9.46	.80	12.93	4.3	9.29	9.43	.6368

COW NO. 5.—*Rations Calculated to Digestible Constituents for 1,000 Pounds of Live Weight.*

NUMBER OF PERIOD.	KINDS OF FOOD.	Pounds Actually Eaten.	Total Dry Matter, lbs.	DIGESTIBLE CONSTITUENTS.				Ratio 1:	Pounds of Milk per Day for Whole Period.	Pounds of Milk Per Day at end of Period when Tested.	Pounds Butter Fat Found per Day.
				Protein, lbs.	Carbo-hydrates, lbs.	Fat, lbs.	Nutritive Substance, lbs.				
Preliminary	Corn silage	35.6	24.15	2 99	10.03	1.00	14.02	4.1	25.90	25.17	1.0092
	Mixture cotton-seed meal, 1, to wheat bran, 2	12.									
First Period	Sweet potatoes	10.	24.26	2.87	15.66	0.78	19.31	6.14	26.31	24.96	.938
	Corn shucks	11.88									
	Cotton-seed meal, 6 / Corn meal 2 / Cowpea meal 1	8.7									
Second Period	Corn and soy-bean silage	40.8	25.46	3.01	10.75	0.89	14.65	4.3	25.38	24.96	.938
	Mixture cotton-seed meal, 1, to wheat bran, 2	12.0									
Third Period	Corn and soy-bean silage	39 6	23.02	2.64	9 64	0.82	13.10	4.43	24.39	24.67	1.0083
	Mixture cotton-seed meal, 1, to wheat bran, 2	9.95									
Fourth Period	Sweet potatoes	10.	24.83	3.03	15 93	0.83	19.79	5.94	22.33	23.76	.95
	Corn shucks	11 6									
	Cotton-seed meal	6.									
	Corn meal	2.									
	Pea meal	1.									
	Average first and fourth periods		24 545	2 95	15 795	0 805	19 55	6 04	24 32	24 36	.944
	Average second and third periods		24 24	2 825	10.195	0 855	13 875	4 36	24 885	24 815	.973

Cow No. 18.—*Rations Calculated to Digestible Constituents for 1,000 Pounds Live Weight.*

NUMBER OF PERIOD.	KINDS OF FOOD.	Pounds Actually Eaten.	Total Dry Matter, lbs.	DIGESTIBLE CONSTITUENTS. Protein lbs.	Carbohydrates lbs.	Fat, lbs.	Nutritive Substances lbs.	Ratio	Pounds Milk Yield per Day for Whole Period.	Pounds Milk Yield per Day for Last Test Period.	Pounds Butter Fat Found per Day.
Preliminary	Corn silage	26 4	19 11	2 57	7 88	0 73	13 89	3 83	8 80	8 65	882
	Mixture cotton-seed meal, 1, to wheat bran, 2	11 1									
First Period	Cotton-seed hulls	13½	17 47	*a* 1 81 56	5 84	0 76	8 16	3 57 4	7 818	8 00	6957
	Cotton-seed meal	4		*b* 1 44	7 44	1 58	9 56	6 32 1			
Second Period	Corn shucks	3 6									
	Wheat straw	5 8									
	Corn meal	2 0	19 69	2 44	9 65	1 13	12 83	4 89	9 057	9 28	885
	Ground wheat	3 0									
	Cotton-seed meal	5 0									
Third Period	Corn shucks	3 88									
	Wheat straw	6 20									
	Corn meal	2 00	20 44	2 46	10 07	0 68	13 21	4 80	8 830	9 00	5513
	Ground wheat	3 00									
	Cotton-seed meal	5 00									
Fourth Period	Cotton-seed hulls	13 5	17 15	*a* 1 53	5 73	745	8 1055	3 57 4	8 286	8 75	6972
	Cotton-seed meal	4 01		*b* 1 41	6 99	77	9 17	6 32 1			
	Average for first and fourth periods.		17 31	*a* 1 545	5 785	75	8 08	3 57 4	7 902	8 375	68445
				b 1 425	7 065	775	9 265	6 32 1			
	Average for second and third periods		20 065	2 45	9 87	0 70	13 02	4 745	8 947	9 09	5697

a As rations are usually calculated. *b* On basis of actual digestion, 3 of hulls to 1 of meal.

Cow No. 19.—*Rations Calculated to Digestible Constituents for 1,000 Pounds Live Weight.*

NUMBER OF PERIOD.	KINDS OF FOOD.	Pounds Actually Eaten.	Total Dry Matter per 1,000 lbs.	DIGESTIBLE CONSTITUENTS. Protein, lbs.	Carbo-hydrates, lbs.	Fat, lbs.	Nutritive Substance, lbs.	Ratio. 1:—	Pounds of Milk Yield per Day for Whole Period.	Pounds of Milk per Day During Last Days of Test.	Pounds Butter Fat Found per Day.
Preliminary	Corn silage	32 00	20 35	2 45	8 52	0.72	11 69	4 68	5 39	5 15	.3144
	Cotton-seed meal, 1, wheat bran, 2	10.00									
First Period.	Cotton-seed hulls	13.5	17.83	*a* 1.59	5 96	0.775	8.395	4.96	4.24	4.22	.3061
	Cotton-seed meal	4.20		*b* 1.47	7.28	0.80	9.55	6.31			
Second Period.	Corn shucks	3.8	18.10	2.50	9 10	0 69	12.29	4.34	5.76	5.82	.3244
	Wheat straw	3.5									
	Corn meal	2.0									
	Ground wheat	3 0									
	Cotton-seed meal	5.0									
Third Period	Corn shucks	4 13	19.13	2.51	9.64	0.69	12.84	4.53	5.10	4 54	2697
	Wheat straw	4.15									
	Corn meal	2.00									
	Ground wheat	3.00									
	Cotton-seed meal	5.00									
Fourth Period.	Cotton-seed hulls	9 6	13.20	*a* 1.295	4.36	.60	6.255	4.53	3.57	3.92	2615
	Cotton-seed meal	3.24		*b* 1.16	5.305	.61	7.075	5.89			
	Average of first and fourth periods		15 52	*a* 1.48	5.16	0.685	7.28	4.75	3.91	4 07	2838
				b 1.32	6.29	0.705	8.31	6.1			
	Average of second and third periods		18 645	2.505	9.37	0.69	12.565	4.4	5.40	5.18	29755

IS SKIM, OR BUTTER MILK BEST FOR PIGS?

Fifteen thirty young pigs were purchased for this trial to test separated or centrifugal skim milk, against buttermilk churned from sour cream for making pork. The pigs were farrowed September 4th and 11th. Their breeding by the two dams which were litter sisters was exactly alike. They were taken from the sows at six and seven weeks old and fed about what they would eat clean of a mixture of meals containing wheat middlings, and bran, corn, and linseed meals. The males were castrated while on dams. The pigs were fed as litters of eight and seven until November 10th, when four lots were made by weights. They were afterward marked so individual pigs could be known. About the first of December evidence of unthrift and parasitic worms were shown. Condition mixtures, of which some of the pigs ate freely, were made and kept in pens. It is probable that all pigs did not eat much of this, as some were not bettered by it; then iron sulphate was pulverized and mixed in the feed of the pigs frequently.

The condition mixture consisted of the following:

1 peck hard-wood ashes.
1 pint fine salt.
2 pounds copperas.
½ pound black antimony.
½ pound sulphur flowers.
1 peck charcoal.

These were intimately mixed, and some of it kept in a box in each of the yards. The pigs which ate of the mixture, so far as known, are the ones which continued to grow with the greatest regularity, yet the results seem to indicate that the parasites were the controling factor, so far as returns for milk fed were concerned. Late in December it became necessary to remove three pigs because of unthrift, and the remaining twelve were fed in four lots of three each through nine periods of ten to twelve days each.

These pigs kept in good form and grew moderately well. Frequently individuals were found to slacken in growth, and iron sulphate was then administered as above indicated as a vermifuge. Each lot of pigs had the run of a large pen, and were at liberty to root the yards as much as they pleased. Sufficient exercise was thus afforded.

The feed, after reducing to twelve pigs, consisted of wheat middlings of good quality, and skim milk which had been through the centrifugal separator, or buttermilk from cream which had been taken off by the separator, soured and churned quite exhaustively.

It was the intention to feed the same amount of middlings to all lots of three pigs; to feed skim and buttermilk in like amounts to different lots of pigs after they were separated the last of December. Pen No. 1 received a given amount of sweet skim milk, and Pen No. 2 twenty-five per cent. more, or five gallons for every four given to Pen No. 1. In the same way Pen No. 3 received the same amount of buttermilk that was fed Pen No. 1 of skim milk, and Pen No. 4 was given twenty-five per cent. more buttermilk than Pen No. 3 received, or as many pounds as was given Pen No. 2 of skim milk. The regularity of these amounts was several times broken into by lack of milk enough to supply all, especially of buttermilk, and a considerable amount of this was purchased from Cloverdale Farm, but it was of the same general quality, having been produced by the same methods of butter-making. Skim milk was needed at times, but was generally in full supply for calves and pigs. Thus the amounts differ somewhat. The pigs ate heartily, and gave so little trouble in the amount of waste that it was disregarded for Pens Nos. 1, 2 and 3, but Pen No. 4 made so much waste in the ninth period that it was taken out and was regarded as all middlings, although, having been wet with water, or milk, it was considerably overestimated.

The gains in live weight were seventeen to nineteen ounces per day and pig in the Pens 1, 2 and 3 during the whole of the nine periods to March 30th, whilst Pen No. 4 gained a little more than over fourteen and a half ounces per day and pig.

When these pigs were separated into lots they were an even thrifty looking bunch. Most of them grew along together well, as may be noted by the weights by pens. Nos. 1 and 2 were slaughtered soon after the close of the experiment. Pen No. 2 was slaughtered March 31st. It was composed of pigs No. 5, 200 days old, weight 156 pounds; after twenty-four hours' fasting 147½ pounds. No. 12, 207 days old, weight 154 pounds; after twenty-four hours' fasting 144 pounds. No. 14, 207 days old, weight 159 pounds; after twenty-four hours fasting 149½ pounds.

Pig No. 5 was dressed at Experiment Farm, the other two at a near-by slaughter-house, and the dressed weights reported back. The following table shows the percentages of dressed weight and waste before and after fasting:

	Dressed at Experiment Farm.	Dressed at Slaughter-pen.	
	Pig No. 5.	Pig No. 12	Pig No. 14.
Carcass in per cent. of first weight	75.64	72.72	71.07
Offal in per cent. of first weight	24.36	27.28	28.93
Carcass in per cent. of fasted weight	80.00	77.77	75.59
Offal in per cent. of fasted weight	20.00	22.23	24.41

Pen No. 1 went to slaughter-house April 2d, weighing 401 pounds. The dressed weight reported was 339 pounds, or about a medium between the percentage made by No. 5 and an average of the percentages made by Nos. 12 and 14.

The weights were taken early in the afternoon in all cases. The pigs were not fed at noon. Two feeds per day only were allowed, and thus it had been some hours since feeding. Under these conditions of feeding it would seem safe to discount about one-fourth of the weight for offal, or if pigs are fasted twenty-four hours, to discount but one-fifth.

Pen A, consisting of the three pigs most infested by worms, was sold to private parties who rather have such a shote to feed than to buy a young one. They were not thrifty enough to feed well. Pen No. 3 was fed for several periods, but did not gain enough after the seventh to pay anything for skim milk fed.

Pen No. 4 did not pay for milk in either the 8th, 9th or 12th periods, but did pay in the 10th and 11th periods 20.7 and 16.1 cents respectively per hundred weight for the buttermilk fed.

The average dressed weight was 75.6 per cent. of afternoon weights.

An inspection of the table will show the amount of food, wheat middlings and skim or buttermilk fed during each period, the weight of each lot of three pigs at the end of each period, the gain made by the three during the period, and the amount of middlings and milk required by each lot in each period to produce one pound of gain in live weight. The last column shows the cents paid per 100 pounds for milk when there was gain enough during a period to pay anything. During the later periods the milk brought no return and the gain was insufficient to pay eighty-five cents per 100 pounds for wheat middlings consumed. It must be considered that at that price the feed merchant had the best of the trade.

Pen No. 1 paid 20.8 cents per 100 pounds for skim milk during nine periods covering ninety-four days. The pigs were about three and a half months old when this feeding began.

Pen No. 2, fed the same as to middlings, but which consumed 26.7 per cent. more skim milk than did Pen No. 1, paid 20.08 cents per 100 pounds for what was consumed during the same time, and under exactly like conditions as to housing.

Pen No. 3, consisting of three pigs fed on middlings and buttermilk, the same weights of middlings and buttermilk being fed as were fed Pen No. 1 of middlings and skim milk, paid 19.87 cents per 100 pounds of buttermilk fed during the nine periods covering ninety-four days. During seven periods covering seventy-four days the buttermilk was worth thirty cents per 100 pounds, but when carried forward to 121 days was worth only twelve cents per 100 pounds.

Pen No. 4, consisting of three pigs fed same as Pen. No. 3, except an excess of 20.07 per cent. of buttermilk over what Pen No. 3 consumed, paid 20.7 cents per 100 pounds for the buttermilk consumed during seven periods covering seventy-four days. The buttermilk was dropped for this pen of pigs at the end of the seventh period. A record was kept through two later periods, the 8th and 9th, after which it was resumed again for three periods of seven, ten and ten days respectively. During the two periods of ten days each without buttermilk, but getting practically all the wheat middlings they could eat, the three pigs gained only four and twelve and a half pounds for the the three. Water was supplied in abundance. When buttermilk was fed again the gains were thirty-three and a half pounds in seven days, forty-one pounds in ten days, and ten pounds in ten days. On the whole feeding this pen of pigs paid 15.5 cents per 100 pounds for the buttermilk fed them as the calculations were made.

All the above calculations are based on dressed weight, eighty per cent. of the live weights of the pigs, and five cents per pound for dressed carcasses, or four cents per pound for live weight.

The pigs were found to dress an average of only 75.5 per cent. of the live weights. This reduces the actual amounts paid by each pen of pigs for skim and buttermilk to the following in cents per 100 pounds of milk:

	7 Periods.	9 Periods.	10 Periods.	12 Periods.
Pen No. 1, 3 pigs, fed skim milk.....	15.	17.	.....	.....
Pen No. 2, 3 pigs, fed 26.7 per cent more skim milk than Pen No. 1....	20.17	16.78	.....	.....
Pen No. 3, 3 pigs, fed buttermilk.....	25.61	15.56	.....	8 51
Pen No. 4, 3 pigs, fed 20.7 per cent. more buttermilk than Pen No 3....	17.86	.....	12.30	.....

The last column for each pig, in the table, showing the amounts received during each period for the skim milk and buttermilk on the basis of eighty per cent. dressed weight indicates something of what may be expected on that basis, and that percentage may be attained easily without the parasites to contend with.

There was, as noted above, a very great interference with growth by internal parasites. During those periods when the pigs made a thrifty advance in growth there is no reason to complain of the price of the milk, but whenever the parasites seemed to get a strong hold little or nothing was received for the milk, and the gain was not enough in some cases to pay for the other food. This shows swine breeders a danger to be guarded against. Pigs should be cleansed of the parasites and the yards changed often, and long enough to have the old places purified and the vermin exterminated.

For controling parasites see Bulletin No. 127.

TABLE I.

Number of Period.	Dates and Number of Days in Periods.	Pen 1—Three Pigs.							Pen 2—Three Pigs.						
		Wheat Middlings Fed.	Skimmilk Fed.	Weight of Pigs at End of Period.	Gains During Each Period.	Required to Make 1 lb. of Gain in Live Weight.		Value of Milk in cts. per 100 lbs., Middlings at 85c. per cwt.	Wheat Middlings Fed.	Skimmilk Fed.	Weight of Pigs at End of Period.	Gains During Each Period.	Required to Make 1 lb. of Gain in Live Weight.		Value of Milk in cts. per cwt., Middlings at 85c. per cwt.
						Wheat Middlings.	Skimmilk.						Wheat Middlings.	Skimmilk.	
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
1st	Dec. 26–Jan. 5 ..... 10	60 0	105 0	168 ¾	25 5	2 35	4 01	49 94	61 5	131 75	179 ¾	31	19 8	4 25	54 52
2d	Jan. 5–16 ..... 11	81 0	148 0	197 ¾	29 0	2 79	5 10	31 93	81 0	198 75	214 ½	34 75	2 33	5 72	35 31
3d	Jan. 16–27 ..... 11	99 0	198 0	232 ¼	34 5	2 87	5 74	27 19	99 0	247 75	241 ¾	27 25	3 63	9 09	10 06
4th	Jan. 27–Feb. 6 ..... 10	105 5	180 0	274 ½	42 25	2 50	4 26	44 01	105 0	213 75	291 ½	49 75	2 12	4 30	51 12
5th	Feb. 6–16 ..... 10	117 0	180 0	303	28 5	4 10	6 32	8 15	117 0	225 0	319 ½	28	4 18	8 04	5 56
6th	Feb. 16–26 ..... 10	127 5	180 0	337 ¼	34 25	3 72	5 26	15 93	121 5	225 0	.....	.....	.....	.....	.....
7th	Feb 26–March 10 .... 12	165 75	216 0	361	23 75	6 98	9 09	0 00	165 75	270 0	398 0	78 50	3 66	6 31	14 09
8th	March 10–20 ..... 10	140 0	180 0	404 ½	43 5	3 22	4 14	30 51	140 0	225 0	424	26 00	5 38	8 65	0 00
9th	March 20–30 ..... 10	152 0	177 0	449	44 5	3 42	3 98	26 47	152 0	225 0	469	45 0	3 38	5 00	22 54
		1047¾	1564	.....	.....	3 43	5 12	20 8	1043¼	1962			3 26	6 12	20 08

TABLE I.—*Continued.*

Number of Period.	Dates and Number of Days in Periods.	Pen 3—Three Pigs. Wheat Middlings Fed. lbs.	Buttermilk Fed. lbs.	Weight of Pigs at End of Period. lbs.	Gains During Each Period. lbs.	Required to Make 1 lb. of Gain in Live Weight. Wheat Middlings. lbs.	Buttermilk. lbs.	Value of Milk in cts. per 100 pounds, Middlings at 85 cents per cwt.	Pen 4—Three Pigs. Wheat Middlings Fed. lbs.	Buttermilk Fed. lbs.	Weight of Pigs at End of Period. lbs.	Gains During Each Period. lbs.	Required to Make 1 lb. of Gain in Live Weight. Wheat Middlings. lbs.	Buttermilk. lbs.	Value of Milk in cts. per cwt., Middlings at 85 cts. per cwt.
1st	Dec. 26–Jan. 5..... 10....	61.5	93 0	161. ¼	16.0	3.84	5.41	12.67	61.5	114.75	170.	31.50	1.95	3.64	64.35
2d	Jan. 5–16..... 11....	81 0	156.0	180.	18.75	4 32	8.32	5.14	81.0	190.25	204. ¾	34.75	2.33	5.19	38.91
3d	Jan. 16–27..... 11....	99 0	197.0	236.	56.0	1.77	3.52	70.89	99.0	239.0	228. ¾	23.50	4.21	10.17	4.14
4th	Jan. 27–Feb. 6..... 10....	105.5	178.0	282.	46.0	2.29	3.87	53.06	105.5	221.38	284. ¼	56.25	1.88	3.94	60.96
5th	Feb. 6–16..... 10....	117.0	182. ¼	318. ½	36.5	3.21	4.99	25.48	117.0	228.0	322. ¼	37.75	3.10	6.04	21.61
6th	Feb. 16–26..... 10....	128.25	180.0	.....	.....				128.25	225 0	333. ½	11.25	11.40	20.00	.....
7th	Feb. 26–March 10.... 12....	165.75	216.0	398.	79.5	3.70	4.98	17.17	165.75	257.12	376.	42.50	3.90	6.05	17.54
8th	March 10–20..... 10....	140.0	150.0	412.	14 0	10.00	10.71	0.00	140.0	.....	384.	8.00	17.50	.....	.....
9th	March 20–30..... 10....	152.0	150.0	444.	32.0	4 75	4.69	0.00	120.37	.....	396. ½	12.50	9.63	.....	.....
	Totals and average of above	1050.	1522.	.....	.....	3.51	5.10	19.78	1018.4	.....	.....	.....	2 78	5.72	28.62
	Totals and average of first seven periods.....	755 75	1222.	398.	252.75	3.00	4.83	30.02	758.0	1475.5	.....	.....	3.	.....	.....
10th	March 31–April 6..... 7....	74.75	122.0	447.0	3.0	24.92	40.67	.....	90.75	210.0	430.0	33.5	2.71	6.27	20.71
11th	April 7–16..... 10....	136.00	180.0	467.5	20.5	4.93	8.78	.....	136.0	300.	471.0	41.0	3.32	7.32	16.13
12th	April 17–26..... 10....	89.56	180.0	471.5	4.0	22.39	45.00	.....	116.38	300.	481.	10.0	11.64	30.00	.....

SUMMARY OF RECORD OF MILK AND BUTTER PRODUCTION OF STATION HERD 1895 AND 1896.

During this year we believe epizootic abortion was driven out completely from the herd. The calves were born at regular time, with two or three exceptions, and the notable one for a period of 248 days gestation was raised. The cows were in no condition to give large yields in 1895 after holding over so long from the abortions of 1894, but coming in fresh in the fall and early winter were prepared for a good record in 1896. This record follows that for 1895 in this report. Beside the cows, records of which are given below, there were two others milked for one and a half and six months. One of these was an old imported Holstein Friesian cow which lost one-half her udder and was turned into beef. The other was a polled cow milked here for the owner until she could be sold. In this year's record the cow called Polly B. in last Biennial Report, having been registered, is given her registered name, Polly K., No. 115377, A. J. C. C.

Cow No. 2.—Grade Jersey, was dry nearly three months in midsummer. Came in fresh September 15th with grade Holstein Friesian male calf.

Cow No. 5.—Grade Jersey. This cow did not dry off, but milked the whole year and brought a cow calf by Jersey King, No. 2, on November 19th. This calf weighed only thirty-four pounds, and was born five weeks too soon. Raised it as Jersey King's No. 5.

Cow No. 7.—Came fresh September 1st, after being dry but one month. Cow calf by Polled Angus, sire. Raised as Angus' No. 7.

Spot.—This cow was sick in winter and passed gravel, which trouble yielded to treatment, but she did not recover her normal flow of milk. No calf this year, and cow dried off last of December to come in early in January, 1896. Spot came in fresh early in December, 1893, and was nearly dry when she freshened by abortion in September, 1894, and only dried off for about two weeks at the end of 1895, to begin 1896 fresh. This made 1895 an "off" year with Spot.

Daisy E.—Was dry in August, 1894, when she freshened with abortion and milked until middle of September, 1895. She came in fresh with cow calf Christmas Day, 1895. Calf was sired by Jersey King, No. 2, and is known as Jersey King's Daisy E. Daisy E. came from southwest Virginia near Fancy Gap, and is evidently a Shorthorn. This cow was purchased in May, hence while

the milk and butter record covers the year, the record of her food was not begun until she came to the Experiment Farm. Hence no comparison can be made. This cow made a considerable loss during 1895 because of the abortion in 1894 and low yield until dried off.

Trixy's Rioter.—Came in with first calf early in January, 1894, and was afflicted with abortion in September of that year. She was bred to freshen again in January, 1896, but was crowded by other cows and brought a dead calf a month earlier. She did not dry off in 1895 because of the accident. She would have been dry one month under normal conditions.

Polly K.—This registered Jersey cow is a half sister to Trixy's Rioter, both having been sired by Thornbrook's Rioter, No. 16592, A. J. C. C. This one came in with cow calf a month later than Trixy's Rioter in 1894. Both had fine cow calves, and both were lost as reported,* while Polly 2d seemed to have had inflammation of the stomach. Polly K. was very small, and when her half sister was bred again she was held back to grow more, so she only brought her second calf in December of this year, another cow calf which is being raised as Polly K. 3d. By going so long in milk after first calf, some three months longer than was intentional, Polly's record for 1895 is not so favorable as it might have been. She grew by the delay from very small to nearly medium size.

Cow No. 18.—This cow went dry over three months and came fresh in August, 1895, with one of the two premature calves, a male, which was raised.

Cow No. 19.—This cow was dry nearly four months and came fresh in fine condition, but retained afterbirth and appeared to have blood poisoning. She finally recovered, but the promise of a profitable year's record was gone.

Fannie of Sedgefield.—This cow became afflicted with actinomyrosis and was not bred. She was treated with iodide of potassium, one drachm daily, until outer skin peeled off. She was considered cured, but the thickening in her throat did not leave, and her breathing was left permanently laborious thereby. Fannie made a two months' record in 1894 which has been reported with that year's record. †

Hayward's No. 6.—Came in with first calf March 28th. Raised calf as May C. Next bred to calve in fall, and gave a long period of lactation, but cow dried herself off and went dry eight months. Came in second time, September, 1896, with cow calf by Stillwater, which is being raised as Stillwater's No. 6. This heifer was a granddaughter of Cow No. 5, and her dam is reputed a good cow.

* Bulletin No. 109, N. C. Experiment Station, page 438, for Trixy's Rioter St. Helier.

† Eighth Biennial Report 1894, page 104.

Hayward's Guernsey Jersey.—This heifer came in about same time as No. 6, milked a little better, and went dry only six months in 1896. The dry period was shortened by abortion under circumstances which indicated it to have been caused by fright. Both cows seem to have an inheritance *away from milk* from their sire, Hayward, a grade Jersey bull raised in or near this city from good stock. Hayward showed a very strong tendency to beef.*

Cow No. 20.—Received this cow on October 12, 1894. Record began the following day. She was giving only four to eight pounds of milk the first half month, but increased to over eight pounds per day for November, and over nine pounds for December. Over 9.4 pounds per day for January, 1896, and was giving four to six pounds per day early in February, when she brought a native cow calf. This cow was still milking over three and a quarter pounds per day at the end of December, 1896. Calf raised as No. 20's Native.

Dora McKee.—Was dry about six weeks in midsummer. Her 1895 record is about a normal one. Her calf previous to this one was by Sir De Bonaire, May, 1894. She was bred again in November.

* Bulletin 93, N. C. Experiment Station, pp. 44–46.

TABLE I. FOR 1895.— *Weight of Cows, Yield of Milk, Per Cent. of Fat in Milk, Butter Fat from Monthly Tests, Calculated Yields of Butter at 85 Per Cent. and 80 Per Cent. Fat, Value of Food Consumed by Each Cow, Showing Gain +, or Loss —, Made by Each Cow During the Year or Time she was at the Experiment Farm.*

	No. 2.	No. 5.	No. 7.	No. 18.	No. 19.	No. 20.	Spot.	Dora McKee	Daisy E.	Trixy's Rioter	Polly K. 115377 A.J.C.C	Fannie of Sedgefield.	Haywood's No. 6.	Haywood's Guernsey-Jersey.
Least weight for year { Month...	Sept.	Mar.	Aug. & Sept.	Oct.	Aug.	Oct.	Mar.	Sept.	May.	July.	April.	May.	April.	April.
Least weight for year { Wt. in lbs.	895.	848	1003.	783.	638.	645.	754.	756.	1070.	737.	550.	546 ½	637.	690.
Greatest Wt. { Month...	June.	Oct.	Mar. & Apr.	April.	June.	Dec.	Dec.	June.	Sept.	Oct. & Nov.	Oct.	Dec.	Dec.	Dec.
Greatest Wt. { Wt. in lbs.	1060	1004.	1095	920	927.	732.	1015.	914	1210	823.	741	673	825.	916 ½
Average weight...	986	903.	1048.	862.	826	694.	899	832	1168	773	635 ½	612.	699	799
Yield of milk (pounds)	3196 7	6997 5	3741	3352 8	1771 9	675 8	3996 4	3204 4	2335 0	1627 8	2668 6	3297 8	1886.7	2228 5
Av. pr. ct. of fat in milk	5 07	4 03	4 37	5 97	5 44	5 11	4 80	6..42	3.59	6 08	6 51	5 22	5 79	4 76
Total butter fat from monthly tests...	148 96	271 7	172 92	195.06	88 93	29 99	203 0	203 3	92 88	100 16	172 26	177 24	109.56	115 28
Calculated yield of butter at 85 per cent. fat	175 25	319.62	203 43	229.49	104 62	35 28	238.84	238.95	109 62	117 84	202 78	207.81	128 99	135 62
Calculated yield of butter at 80 per cent. fat	186 2	339 6	206.15	243.8	111 16	37 89	253 75	254.2	116 10	125 2	215 3	221.55	136 95	144 10
Value of 85 per cent. butter at 25c.	$ 43.81	$ 79 90	$ 50.86	$ 57.37	$ 26.16	$ 9 82	$ 59 71	$ 59.74	$ 27.41	$ 29.46	$ 50 69	$ 51 95	$ 32 25	$ 33 91
Value of foods consumed by cow	52.91	65 91	59 08	41.35	32 44	12 08	52.49	51 90	...	42 99	45 62	51 95	46 46	46.22
Difference—Gain +	.....	+ 13 99	.....	+ 16 02	...	...	+ 7 22	+ 7 84	...	.....	+ 5 07	0.00	.....	.....
Loss —	9.10	...	8.22	...	6 28	2 26	...	...	...	13 53	.....	...	14 21	12 31

NOTES ON RECORDS OF COWS FOR 1896.

Cow No. 2.—This was the best record made by this cow. She was bred twice, and each time aborted with a very small fœtus. She became fat, and has been sent to butcher since completion of 1896 record.

Cow No. 5.—The record of No. 5 is not as good as in 1895, though it has a satisfactory balance on the right side. Instead of the calf we have been wont to get from this cow, an abortion resulted from violent exercise. Bred again to Jersey King No. 2.

Cow No. 7.—A small balance is seen in the table of records against No. 7. It is less than last year, owing to reduction of prices in part, but mainly to gain of thirty pounds of butter over last year. This cow freshened in August during the very hot weather and never seemed to yield as much as usual for her. This may be partly due to not having had the usual rest, as she only was dry about ten days. No. 7 has two cow calves in the herd, and is now in calf to Jersey King No. 2.

Cow No. 18.—A good record in 1896. This cow has no calves here which are to come under test, and she has been discarded to make room for those growing up. She went with Dora McKee December 23d.

Cow No. 19.—This cow was sold early in September. She did not breed after recovering from the trouble in 1895, and has done nothing since.

Cow No. 20.—See back. Notes are for 1895 and 1896.

Spot.—A bull calf from Spot early in January was sent to Capt. J. C. Camp, Green River, Polk County, N. C. She was bred to come in again in December, and brought another bull calf, which was sent to Mr. O. W. Sutton, Mt. Olive, Duplin County, N. C. Thus Spot has brought two calves during 1896. She became lame in one hind foot in November, caused perhaps by habit of standing in gutter wherein kainit had been used to prevent loss of ammonia. This lameness has dragged along into 1897. It seriously affects the yield from Spot for both years. However, this 1896 record by Spot is her best, as it is the highest yield of milk and of butter made by any cow in the Experiment Farm herd. The two calves although both grades are by strongly bred sires. Capt. Camp's calf was by Jersey King No. 2, owned by the N. C. Asylum for the Insane, while Mr. Sutton's calf is a grade Shorthorn by Stillwater, a dairy-bred bull from the Spencer herd of Chautauqua County, New York.

Dora McKee.—Dora was apparently crowded by strong cows, and aborted in May. She did not dry off during the year. Increasing lameness from the old broken leg made it desirable to finally dispose of her, and she was sent to the butcher December 23d, 1896.

Daisy E.—This cow was dry about six weeks, September and October, and began to milk well, but became lame about the same time Spot did, and from the same cause. This seriously reduced her yield the last part of the year and greatly damages that of 1897. In January, 1896, Daisy's yield of milk was 1,000.95 pounds of weighed milk, the largest monthly record yet made in this herd. The butter yield for that month was but 37.7 pounds as against her November record of 47.5 pounds from 961.8 pounds of milk containing a higher per cent. of fat. The check in yield of milk and butter turned the balance for this year's record to a slight loss.

Lady Victoria Pogis (A. J. C. C. No. 46573).—This cow had been dry a long time when received at Experiment Farm, and has so far failed to breed here. In order to bring the influence of lactation to bear on her as an aid to efforts at breeding her, she was regularly milked after about the middle of May, 1896. Before May was out Lady Victoria was yielding about two quarts of milk daily, and since that month has averaged over a gallon per day, butter from which more than pays for her keeping. Thus the loss shown in her column of the record for 1896 is the excess of cost of food for the full year over the value of butter from June to December inclusive. Since June 1st she has paid one-fourth more than the cost of each month's feed, and there is still a hope that she may breed again.

Trixy's Rioter.—Trixy was dry about one month and brought a cow calf. This calf had some malformation of the cervical vertebræ which caused its head to slip round to its side. The movement back and forth doubtless injured the spinal cord, and calf lived but a few days. This cow has been a constant loss, and when she came in this time, under normal conditions, yielded at most two gallons of milk and a little under one pound of butter per day. She is in contrast with her smaller half-sister, Polly K. This comparison may show the difference of inheritance from a poor and a good dam.

Polly K (A. J. C. C. 115377).—This cow was dry about five weeks. She came in in good condition, but her udder caked some and finally resulted in loss of one-quarter of the udder. Polly was sold to Prof. McCarthy and taken from Experiment Farm December 10th. Her record to date of departure was 4,650.2 pounds of milk and 297.3 pounds of butter. If the year had been completed at the same rate as for nine and a half days in December, the yield would have been 4,959.8 pounds of milk and 317.86 pounds of butter.

Fannie of Sedgefield.—Fannie went dry less than two weeks in August. She started her record in this period with a low yield, as did every cow that began a new period of lactation during or soon after the very hot weather of 1896.

Deborah.—This is a daughter of Dora McKee. She is a full Jersey, but not registered. Deborah was two years old in May, and brought her first calf August 17th. Hence her milk record covers but a few days over four months, while she has been charged for the full year's feed, and thus appears a balance of $15.86 against her. This is less than $1.33⅓ per month, and will be turned the other way if no accidents happen to this promising heifer.

Hayward's No. 6.—Dried off by middle of January and went dry *eight months.* Freshened in September and yielded a small amount of milk for less than four months, which marks this cow for her proper province—to make beef.

Hayward's G. Jersey.—This cow did somewhat better than No. 6, but has fallen far below what might have been expected. She is a better beef than dairy cow.

Substitute.—This is a family cow, not milked on Experiment Farm, but her 1896 record becomes of interest here because her calf has been raised to go into the young herd, and also from the fact that she is an Ashe County Shorthorn cow, and the calf is of the same breed. This cow came to Raleigh in a carload of beeves, but brought a calf about the first of April, 1896. She began to be milked April 9th, and in eight and two-thirds months yielded 5,588.5 pounds of milk, which, according to monthly tests, contained 333 pounds of butter, counting a full month for butter yield for April. The average per cent. of fat in milk was 4.935. In ten months the yield from this cow was, milk, 6,050.4 pounds. For butter, adding January, 1897, to nine months of 1896, gives 359.24 pounds.

The record made by Substitute in ten months exceeds that of every cow in this herd, except Spot, for milk and butter, and Daisy E, and No. 5 for milk.

From the above notes and the tables showing condensed record of the cows on the Experiment Farm, it will appear plain to every reader that there are some cows in this herd *that do not pay for their food.* This has been apparent for some time, but some have not been culled out before the end of this year's record in order to give time, after the trouble from epizootic abortion was over, for cows to resume a normal flow of milk, thus avoiding hasty judgment and consequently erroneous work. A strong example in this line of feeding at cost should set farmers to thinking, and weighing feed and milk, and to using the Babcock Tester in earnest.

Among the cows finally disposed of, No. 2 was found to have passed her usefulness as a breeder, hence in her fat condition as beef she has served the best purpose she could have been put to.

TABLE II.. 1896.—*Weight of Cows, Yield of Milk, Per Cent. of Fat in Milk, Butter Fat from Monthly Tests, Calculated Yield of Butter at 85 and 80 Per Cent. Fat, Value of Butter per Cow, and Value of Food Consumed by Each Cow, Showing Gain +, or Loss —, Made by Each Cow During the Year or Time she was at the Experiment Farm.*

	No. 2.	No. 5.	No. 7.	No. 18. 2	No. 19. 1	No. 20.	Spot.	Dora McKee	Daisy E.	Lady Victoria Pogis.	Trixy's Rioter.	Polly K.	Fannie of Sedgefield.	Deborah.	Hayward's No. 6.	Hayward's Guernsey-Jersey.
Least Weight } Month	Jan.	Dec.	Aug.	Jan.	Jan.	Mar.	Dec.	May.	Dec.	May.	Nov.	Oct.	Sept.	Dec.	Sept.	July.
for year . } Wt in lbs..	931.	831.	1031.	865.	828.	729.	801.	755.	908.	827.	763.	675.	680.	894.	788.	878.
Greatest Wt. } Month ...	Nov.	Aug.	June.	Nov.	May.	Dec.	Oct.	Feb.	Aug	Dec.	Oct.	Jan.	June.	Jan.	Aug.	Dec.
for year. } Wt in lbs..	1039	981.	1118.	941.	879.	869.	1055.	813.	1229.	967.	861.	765	783.	732.	877.	1027.
Average weight for year	982.5	916.	1077.	897.	841.	788.	920.	792.	1120.	900.	828.	723.	734.	817.	855.	967.
Yield of Milk, 2 1-6 lbs. 1 quart, 8⅔ lbs. 1 gallon (pounds)	5292.2	6714.7	4478 7	3845.3	1848.9	4358.	7464.	3483.	6750.3	2151.6	2581 4	4650 2	3658.9	1516.7	1400	2117.4
Average per cent. of fat in milk.	4.82	4 04	4 57	6.285	4.99	5.36	4.37	6.36	3 86	4.93	5 50	5 56	5.21	6 725	5 49	5 02
Total butter fat from monthly tests ...	260 83	247 37	198.85	230.22	92.53	211.15	337.38	229.37	252.0	105 94	139.68	252.72	171.17	97.04	80.61	103.25
Calculated yield of butter at 85 per cent. fat ...	306.86	291 03	233 97	270.85	108 86	248 42	396 93	269 84	296.46	124 56	164.33	297 31	201.37	114.17	94.82	121.47
Calculated yield of butter at 80 per cent. fat	326 04	309 21	248 56	287 77	115.66	263.94	421.72	286 71	315 0	132.42	174 6	315.9	213 96	121.3	100.76	129 06
Value of 85 per cent. butter at 25c per pound..	$ 76 71	$ 72 76	$ 58.49	$ 67.71	$ 27.21	$ 62.10	$ 99.23	$ 67 46	$ 74.11	$ 31.14	$ 41.08	$ 74 33	$ 50 34	$ 28.54	$23.7(	$30.37
Value of food consumed by cows	64 07	61 17	60 99	55 99	31.67	54 76	59 87	58.77	75.03	43.03	52.16	52.57	45 82	44 40	30.01	36 61
Difference—net gain +..	+12 64	+11 59	.....	+11 72	...	+7 34	+39.36	+8 69	.....	.....	.....	+21 76	+4 52	.....	.....	.....
Difference—net loss —..	.....	.....	—2 50	.....	—4 46	.....	.....	.....	—0 92	—11.89	—11 08	.....	.....	—15 86	—6.31	—6 24

1 Sold September 1. 2 Sold December 23.

Dora McKee had infirmities coming on, and Nos. 18 and 19 had passed out of usefulness as dairy cows, both having failed to breed, and, as grade cows, not being worth enough to warrant spending further efforts on them.

Trixy's Rioter has never paid, but will be retained until milked out this time, or sold on her merit.

The Hayward heifers would be good cows to enter a beef raiser's herd. They are easy keepers and are easily fattened. They should have gone into a herd for that purpose rather than into beef direct, in view of scarcity of good cows for the production of beef. Where feed is cheap, far from the city, they could pay for keep.

Fannie of Sedgefield may be dropped for non-breeding this year.

Polly K. came to this herd for two years and has proved a profitable member. She went to a new owner in December.

There will be coming into service in the fall and winter of 1897–98 a number of heifers from cows No. 5, No. 7, Daisy E., Polly K., No. 20 and Substitute. A daughter of No. 6 began in milk at the end of December last, but may not be retained.

There are cow calves from the 1896 produce of No. 6, Daisy E. and No. 7, by Stillwater, to be raised.

In all probability there is not a herd of cows in the hands of any one of the readers of these notes but that has some one or more members which it would be betrer to cull out if the right cow were known. These are the ones termed "robber cows" by writers, the ones which cost more than they produce. This standard of cost will vary much with location and market. The standard for production should rest on yield of milk and butter fat.

About 200 pounds would be a good standard to start with, and below which to discard individuals. The amount of food consumed by cows and the use made of it are also two points of great importance to be taken into consideration. It is regretted that the small area of Experiment Farm has prevented our raising sufficient clover and pea-vine hay to nearly balance rations, instead of having been obliged to use wheat bran and cotton seed and other meals so freely. This would have turned the purchase-money for foods much more toward the pocket of the home farm, and would have made the cows the honored purchasers and consumers of more home produce than they have been able to use.

With these few remarks, and suggesting the use of scales to determine the food actually consumed, as well as to indicate the returns in products made by each cow, and the Babcock Tester for fat, we turn to show the amount of food consumed by the cows in making the above records.

Foods Consumed by Cows 1895.

The chief foods used to feed cows were corn silage for January, part of February, May, June, September, October, November and

December, with wheat bran and cotton-seed meal. Wheat bran and cotton-seed meal have usually been fed in the ratio of two to one by weight, and from three to five pounds of silage is fed for every pound of the mixed meal.

For part of February, March and April the same meal feed was given with silage made from corn and soy beans grown in alternate "hills." The beans suffered from shading of corns and were not as prominent in the ration as we had desired. In May some prickly comfrey was fed, in July and August cowpea-vine silage, and following it a siloge made of freshly-cut corn, mixed with crimson clover straw and chaff, with water enough used to moisten the dry articles and bring them into fermentation. In September and October green corn was fed to some extent. Crimson clover hay was fed in November and December. To some cows linseed-oil meal and cowpea meal were fed. The cows were thus fed in barn for the full year. They were tied in stanchions to feed, and often stayed there during the day, to be turned loose in a large yard with access to water during the night. Whether tied up in the stanchions or turned loose, the comfort of the cows has been considered, as the yields of milk and butter are dependent on that portion of the food which is left from supporting the cow, and supplying whatever is used in the system to overcome discomfort, or rather wasted by discomfort and excitement.

In 1896 there may have been a somewhat wider range of foods. Cotton-seed meal was fed every month to nearly every cow. One cow, Daisy E., has been seriously affected by cotton-seed meal previous to her purchase by the Experiment Station, and for her linseed-oil meal or cowpea meal was mainly used instead of cotton-seed meal. Wheat bran was superseded by corn bran in June, July, August and September, after which the price of wheat bran dropped so low that it was again fed. Corn silage was the principal coarse food until May, and from October to the end of the year both months included. In June rye hay and cotton-seed hulls, with hulls and cowpea vines for July, whilst green corn and cowpea vines in August were the principal coarse feeds. This may seem rather out of place to feed the coarse dry foods in midsummer, but it is during the time when the aim is to have dry cows and little product to handle. Had the farm a little greater area the cows could cut their own feed from Bermuda grass and clover pasture at this time. As it is only two cows were grazed out in 1896, and for three months one of these was not fed in barn, and to the other next to nothing was fed during that time.

The prices charged and paid by cows for three years, with net results each year and the average result for each cow, is given in Table III. No credit is given any of them for calves. During the first of the three years few calves could have been raised, and

TABLE III.—*Prices Paid, by Cows, for Food, 1894–5–6; also Net Results, by Several Cows, in those Years.*

NAME OF ARTICLE.	Price Paid in 1894.	Price Paid in 1895.	Price Paid in 1896.	NAMES OF COWS.	Profit+ Loss — 1894. $	Profit+ Loss — 1895. $	Profit+ Loss — 1896. $	Average Result $
Coarse Foods.								
Green grass, green rye, green corn or peavines; also waste when re-fed	$ 4.00	$ 4.00	$ 4.00					
Corn silage or waste silage when re-fed	5.00	5 00	5 00	No. 2	+ 8 02	— 9.10	+12.64	+ 3.85
Soy bean, cowpea vine, or C. clover, straw and corn silage	7 50	7.50		No 5	— 0.36	+13.99	+11.59	+ 8 41
Partly cured corn and re-fed waste		7 50		No. 7	+ 4.07	— 8.22	— 2.50	— 2.22
Prickley comfrey	4 00	4 00	4 00	Spot	+23 03	+ 7.22	+39.36	+23.20
Corn stubble		2.00	4 00					
Cotton-seed hulls	4 00	4.00	4 00	Dora McKee	+ 8 59	+ 7 84	+ 8.69	+ 8.37
Corn shucks		9 00	9.00-7.00					
Blade fodder, crimson-clover hay				Trixy's Rioter	— 6.34	—13 53	—11 09	—10 32
Sheaf oats, peavine hay and re-fed waste from these	15.00	15.00	15.00	No. 18	+17 88	+16.02	+11 72	+15.21
Wheat straw		8 00						
Cotton seed	13.33⅓	13 33⅓	13 33⅓	No. 19	+19 90	— 6 28	— 4.46	+ 3 05
Rye hay, oats in straw			10 00	Polly K.	+ 8.25	+ 5.07	+21.76	+11 69
Fine Foods.								
Cotton-seed meal	20 00	18 00	20 00	Daisy E.		+ 0 49	— 0 91	— 0.21
Wheat bran	20 00	20 00	16 00	Fannie of Sedgefield		+18 18	+ 4 52	+11 35
Cowpea meal	25.00	15 00	25.00	Haywood's No. 6		—14.21	— 6 31	—10 26
Corn meal	25 00	25.00	20 00	Haywood's G.-Jersey		—12 31	— 6 23	— 9 27
Linseed meal	27.00	30.00	22 50	No. 20			+ 7.34	+ 7.34
Wheat meal		15.00						
Oats, ground		35 00						
Oats			22 00					
Corn bran			10 00					

Extremes—Spot gains $23.20 per year; Trixy's Rioter loses $10.32 per year.

every year some are undesirable, and if vealed the milk consumed would be worth more than the calf. Hence no account has been made of them in this statement. If credit were given for cow calves raised, two, No. 7 and Daisy E., would be carried to the positive side for the good calf each year.

The only discussion of prices or results desirable here is to call the attention of farmers to a point often overlooked by them. The crops are sold *at home* to customers who never beat about the bush or cheat, but pay according to what they get and the treatment accorded them, if we farmers do our duty in selection and care.

EXPERIMENT FARM BARN WELL-SUITED FOR ANIMAL COMFORTS.

This barn* has a large shed attached to it on the west, quite open, yet which can be closed up in cold weather, and has been surrounded with a fence so the cows have a narrow yard all around the barn. Thus they can lie in the shade within, or on the north side, or in winter and spring in their favorite places on the south side, when given freedom to select for themselves. At other times they are confined on platforms which allow each cow about as much standing or lying room as she needs for comfort, and the doors are closed in cold, or thrown open in warm weather. To a great extent the extreme ranges of heat are thus tempered, so that when outside it may be either uncomfortably cold or hot, within the barn it is usually very comfortable. This may be inferred from the following record of a Draper's Self-Recording Thermometer. This thermometer was installed in a central location in the main barn in January, 1894, and remained there in constant use nearly three years. Part of the record was given in Bulletin 118. This record, which was made by this thermometer for 1895 and 1896, has been condensed to the following record: The range of temperature in the main barn is a little less than in the large shed, which is not so tight when closed, and which is open to the roof, and consequently is both somewhat cooler and warmer than is the barn. The daily records are averages of twenty-four hourly readings taken from the record made by the instrument each day.

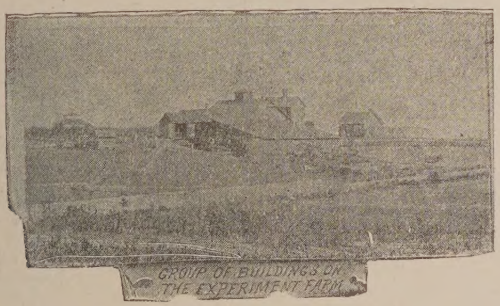
The temperaure averaged below freezing one day in January and eight days in February, 1895. In 1896 there were three days in January and four days in February when the temperature averaged below freezing. The standard maximum and minimum thermometers in the Experiment Farm thermometer shelter registered during some of these months as follows:

In January, 1895, one day, when the maximum remained below freezing, and the minimum rose to above freezing on sixteen days. In February the maximum remained at or below freezing during nine days, whilst there were only four days on which the minimum registered at or above freezing.

In 1896 the maximum remained below freezing during three days, and the minimum remained above freezing fourteen days in January. With rather a broken record in February, the maximum record showing only one whole day below freezing, whilst the minimum recorded above freezing on fourteen days.

*See cuts Bulletin No. 68, N. C. Experiment Station, pp. 99 and 100, and cut herewith.

The records show just what would naturally be expected; much the wider range of temperature in the thermometer shelter as compared with the stable, but when comparisons are made of the mean monthly temperatures the greater range is found to have averaged much nearer the average stable record than might have been expected. The stable averages warmer for the winter half of the year and cooler during the summer half, but the protection from sun, wind and rain is not even hinted at in these average records of temperature. The minimum record conveys some idea of discomfort. Add to these cold days other times when, in the language of the street, "it has turned cold," which is indicated by a cold, icy draft from the north, and the drizzling rainy days, with temperature at or near freezing, and comfortable shelter is warranted and needed in this part of North Carolina.



GROUP OF BUILDINGS ON THE EXPERIMENT FARM.

TABLE IV.—*Stable Temperature Record, Compared with that of Standard Thermometer Shelter.*

Year and Month.	Draper Constant Recording Thermometer. Stable Record.			Standard Maximum and Minimum Thermometers. Standard Thermometer Shelter.				
	Highest Average Daily Temperature.	Lowest Average Daily Temperature.	Av. or Mean Monthly Temperature.	Highest Average Daily Temperature.	Lowest Average Daily Temperature.	Mean or Average Monthly Temperature.	Maximum Temperature for Month.	Minimum Temperature for Month.
1895	F.°	F.°	F.°	°F.	°F.			
January	57.2	25.0	43 0	57.0	17.0	39.2	67.0	7.0
Februry	56.0	17.0	36.9	58.0	10.0	32.1	69.0	3.0
March	63.0	39.6	51.4	67.0	36.0	49.3	82.0	25.0
April	67.0	46.0	58.6	70 0	44.0	57.8	82.0	33.0
May	81.0	53.0	64.3	85.0	52.0	65.8	98.0	41.0
June	82.0	64.7	73.0	88.0	66 0	76.8	100.0	53.0
July	78.2	67.0	68.9	84.0	68.0	76.2	96.0	60.0
August	80.0	69.2	75.5	84.0	67.0	78.2	94.0	60.0
September	81.3	58.1	74.2	86.0	57 0	75.8	98.0	50.0
October	66 7	48.3	58.1	68 0	45.0	57.0	80.0	34.0
November	70.3	42.7	54.2	72.0	36.0	51.0	77.0	26.0
December	61.6	34.0	46.5	64.0	24.0	44.2	68.0	25.0
Mean for the year,			58.7			58.6		
1896								
January	53.7	25.1	42.4	52 0	18.0	39.0	65.0	12.0
February	58.0	26.5	45.4	60.5	19.3	43.9	69.0	7.5
March	68.4	39.8	52.5	69.3	33.5	48.0	75.0	23.0
April	78.0	48.0	60.5	80.0	42.0	68.1	92.0†	31.0
May	88.0	60.1	74.3	83.2	59.8	74.3	94.5	47.0
June	80.4	67 0	74.0	82.5	63.5	79.4	92.0	58.0
July	78.8	85.4	68.9	88.1	67.7	80.1	98.3	63.0
August	85.2	68.8	78.6	86.0	67.0	78.6	98.5	56.0
September	82.2	58.3	72.6	80.5	56.5	72.6	98.0	45.0
October	69.8	53.7	60.6	68.3	51.0	57.3	76.5	37.5
November	69.6	43.7	59.6	65.8	33.3	53.6	77.5	29.0
December*	57.1	33.0	48.5	57.0	25.0	41.2	64.0	16.0
Mean for the year,			61.5			61.3		

* No record after 15th, as instrument was loaned to Station Laboratory.